

## Redirecting device for a safety belt

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The invention relates to a redirecting device for a safety belt according to the introductory section of Claim 1.

A redirecting device for a safety belt in a motor vehicle is known from DE 202 05 570 U1, which basically exhibits a guide element with a guide slit, also designated as a belt eye, for the safety belt. The guide element is in the form of a one-piece metal body of steel plate manufactured by the cold forming process, which is fixed to the vehicle body by means of a fixing screw through a fixing hole in a rear mounting surface. Furthermore, a plastic adapter is connected to the guide element, which exhibits a cylindrical collar for fixing of the same which can be inserted in the fixing hole and also a fixable displacement body at the upper limit of the belt eye for limiting the width of the guide slit.

A disadvantage of this solution has proven to be that the screw head of the fixing screw is only supported on the guide element with an overlap which must be considered extremely small due to the cylindrical collar of the adapter which is located inside the fixing hole. Because of this very slight overlap, the risk that the fixing screw could pop out of the fixing hole of the guide elements is present in the presence of greater loads, as occur, for example, during a crash.

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In order to counteract this unsatisfactory state of affairs, the solution is known of enlarging the overlap by means of correspondingly-sized washers or of using fixing screws with special dimensions, in particular screws with large heads. However, this leads to increased expenditure as regards costs and material. This is the point at which the invention described in the following text comes into play.

Starting from the state of the art according to DE 202 05 570 U1, it is the task of the invention to create an improved device of the generic kind which effectively prevents the fixing screw head from popping out of the fixing hole, while maintaining fixing of an adapter, which in itself is known, to the guide element with simple and low-cost means.

According to the invention the task is fulfilled in conjunction with the characteristics described in the introductory section to Claim 1, in that the fixing hole of the guide element is on the one hand formed by a boring whose cross section is selected so as to be slightly greater than the external diameter of the screw shaft in order to achieve greatest possible overlap of the available free bearing surface of the guide element with the head of the fixing screw, and on the other hand a number of grooves are assigned to the boring, distributed over its circumference, into which for their part fixing arms of the adapter pointing in the axial direction of the boring extend when the adapter is mounted.

Within this arrangement is it particularly advantageous if the grooves are distributed evenly over the circumference of the boring, so that they effect centering of the fixing screw.

As a further development of the invention. it is provided that the fixing arms are formed so as to be elastic within certain limits. It is also proposed that the fixing arms exhibit on their free end respectively a hook-like structure pointing radially outwards engaging behind the walls of the guide element when mounted. It is useful if the fixing arms or their hook-like structure are supplied with a guide chamfer.

In an advantageous manner, in other words without the use of additional components such as washers and without the need to manufacture a special type of screw, the redirecting device proposed here allows a greatest-possible overlap of the available free bearing surface of the guide element by the screw head of the fixing screw to be achieved, taking the state of the art into consideration, and therefore effectively prevents the screw head from popping out of the fixing hole. Finally it is also advantageous to provide exact fixing of the adapter onto the guide element, in other words also to ensure security against free and unwanted turning in relation to the guide element, without basically reducing the aforementioned overlap of the guide element by the screw head.

A further embodiment of the redirecting device formed according to the invention provides that the fixing arms

when in mounted condition form a circle with a slightly smaller internal diameter than the internal diameter of the boring. The advantage of this design consists in the fact that the reduction of the cross-section of the fixing arms ensures that the fixing screw lies against the fixing arms without causing any noise.

Finally, it is possible to form the redirecting device so that the fixing arms of the adapter are positioned in such a way relative to the displacement body that when the adapter is mounted, a basically constant slit width of the guide slits results. This measure ensures that the adapter cannot turn freely in relation to the guide element following mounting, and that therefore a constant, preferably parallel geometry remains in the redirecting device for belt guidance.

The invention will be described in the following text by means of an embodiment shown in schematic form in the drawings. The drawings are as follows:

- Fig. 1 an exploded representation of the redirecting device according to the invention,
- Fig. 2 an assembled redirecting device in a perspective view,
- Fig. 3 a birds eye view of the redirecting device according to Fig. 2,

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Fig. 4 a section I-I according to Fig. 3, and

Fig. 5 a View A according to Fig. 1.

According to Fig. 1 to Fig. 5 the redirecting device for a safety belt not shown in more detail first consists of a guide element 2 provided with a guide slit 1 for the said safety belt, which is fixed to a bearing component of the vehicle body not shown in more detail here, for example a vehicle pillar, by means of a fixing screw 3 led through a fixing hole in the form of a boring 4 in guide element 2. For its part, guide slit 1 exhibits a rounded running surface 5 for the safety belt, in order to ensure unhindered guidance of the same.

Guide element 2 is as shown preferably manufactured in one piece of a piece of sheet steel as a complete metal component by means of cold forming or is formed as a steel plate moulded round with plastic.

Between guide element 2 and the bearing component, an adapter 6 which is already known and is preferably manufactured of plastic by the injection moulding process, is positioned along with a displacement body, which also exhibits an opening 8 which is penetrated by fixing screw 3. Guide element 2 and adapter 6 are therefore arranged coaxially to one another, whereby displacement body 7, as it known, serves to limit the slit width of guide slit 1.

In order to fulfil the set task in a satisfactory manner, taking the fixing of adapter 6 onto guide element 2 into consideration, namely to effectively prevent the screw head 9 of fixing screw 3 from popping out of the fixing hole or the boring 4 of guide element 2 by simple and cost-effective means, according to the invention the cross-section of boring 4 is selected so as to be slightly bigger than the external diameter of screw shaft 10. This achieves a greatest-possible overlap of the available free bearing surface 11 of guide element 2 by screw head 9.

This may at first not be so notable in itself, but in combination with the arrangement of a number, namely of two or more, grooves 12 preferably distributed evenly over the circumference of boring 4 of guide element 2, into which for their part when the redirecting device is mounted, fixing arms 13 of adapter 6 extend which point in axial direction of boring 4 (Fig. 4), a considerable improvement as against the current state of the art is achieved in relation to disturbance-free function of the redirecting device also in case of a crash, as is required by the task set, along with fixing of the adapter 6 on guide element 2.

In the current invention, three grooves 12 are provided, between which areas of the free bearing surface 11 are created or maintained for the screw head 9 (Fig. 4).

As already described in the introductory section of the description, according to the state of the art (DE 202 05 570 U1) these areas are for most part replaced by a cylindrical collar fixed to Adapter 6, which for its part decreases the overlap of the available free bearing surface 11 of guide element 2 by screw head 9 in a disadvantageous manner.

In the version explained here, it has proven advantageous to form fixing arms 13 of adapter 6 to be elastic within limits, in order to make it easier to introduce them into grooves 12 during assembly and in addition also to achieve a certain force fit.

It can also be advantageous, as particularly shown in Fig. 1 and Fig. 3, to provide fixing arms 13 with a hook-shaped structure 14 at their free ends facing radially outwards, which engage behind the walls of guide element 2 when mounted and therefore provide additional interference or form fit.

In the same way it has proven advantageous to provide a guide chamfer 15 on fixing arms 13 or on their hook-shaped structure 14, which also means that mounting of adapter 6 on guide element 2 is easier.

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Reference Nos.

- 1 guide slit
- 2 guide element
- 3 fixing screw
- 4 boring
- 5 running surface
- 6 adapter
- 7 displacement body
- 8 opening
- 9 screw head
- 10 screw shaft
- 11 bearing surface
- 12 grooves
- 13 fixing arms
- 14 hook-shaped structure
- 15 guide chamfers